**Transformation Project**

**The purpose**: The following activities allow students to demonstrate their understanding of the coordinate system and apply that knowledge to various geometric concepts. This project will enable the student to apply, analyse, evaluate and create a product demonstrating their understanding of Geometry.

**Goals**: This project addresses the following curriculum standards for Geometry using basic algebraic skills

1. Draw, construct, and describe geometrical figures and describe the relationships between them.
2. Verify experimentally the properties of rotations, reflections, and translation:
   * Lines are taken to lines, and line segments to line segments of the same length.
   * Angles are taken to angles of the same measure
3. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
4. Describe the effect of translations, rotations, and reflections on two-dimensional figures using coordinates.
5. Understand the a two-dimensional figure is similar to another it the second can be obtained from the first by a sequence of rotations, reflections, and translations, given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them
6. Experiment with transformation in the plane.

**Procedure:**

1. Complete all 7 activities.

2. Graph all activities on regular sized graph paper except Activity 7.

3. Answer all questions connected with each activity.

4. Answers must be complete sentences and in appropriate mathematical terms.

5. Each graph must be drawn using a ruler and must be coloured

**Assessment:** This project will be assessed according to the rubric included in the project. There will be marks deducted for each late school day. The project will be accepted early.

**Due Thursday August 21st** . This project includes activities 1-7

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Graphing Project Date \_\_\_\_\_\_\_\_\_\_\_\_

Key:

Questions: 3 points – Answered all questions accurately.

2 points – Answered more than half of the questions.

1 point – Answered less than half of the questions.

Accuracy: 3 points – Points were graphed correctly.

2 points – Points were graphed with minor errors.

1 point – Points were graphed partially correct.

Colour: 3 points – Coloured all geometric figures and used a ruler.

2 points – Outlined all geometric figures and used a ruler.

1 point – Outlined all geometric figures and did not use a ruler.

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| --- | --- | --- | --- | --- |
|  | **Questions** | **Accuracy** | **Colour** | **Total** |
| **Slides (Translation)** |  |  |  |  |
| **Your Own (Translation)** |  |  |  |  |
| **Trapezium (Reflection)** |  |  |  |  |
| **Your Own (Reflection)** |  |  |  |  |
| **Arrow (Rotation)** |  |  |  |  |
| **Your Own (Rotation)** |  |  |  |  |
| **Your Own (Trans, Rotation, Reflection - 2 shapes)** |  |  |  |  |
| **Part 1- Subtotal** | | | |  |
| **5 points turned project in on time** | | **0 points did not turn project in on time** | |  |
| **5 points overall presentation (in order)** | | **0 overall presentation (not in order)** | |  |
| **Part 2 – Subtotal** | | | |  |

Total Points\_\_\_\_\_\_\_\_\_\_\_

Letter Grade\_\_\_\_\_\_\_\_\_\_\_

**Activity 1: Translations: Sliding Trapeziums**

1. Use the graph paper (landscape – wider at bottom). Put the origin in the centre. Locate these points.

A = (-4, -2), B = (-2, 2), C = (1, 2), D = (5, -2)

Connect ABCDA. The figure you created is called a Trapezium.

1. Add 10 to each x-coordinate and 5 to each y-coordinate

Rewrite points A’ = ( , ), B’ = ( , ), C = ( , ) and D = ( , )

1. Locate A’B’C’D’ and connect to make a trapezium
2. Draw a straight arrow from A to A’. How far over and how far up is it from A to A’?
3. Add 10 to each x-coordinate and subtract 5 from each right-hand coordinate in the **original set of points**.

Rewrite points A” = ( , ), B” = ( , ), C” = ( , ) and D” = ( , )

1. Locate A”B”C”D” and connect to make a trapezium
2. Draw an arrow from A to A”. How far over and down does it sit from A to A”?
3. What type of motion will move the trapezium ABCD onto A”B”C”D”
4. Suppose you wanted to move the original trapezium eight units to the right and twelve units up. Without drawing it, give the coordinates of the vertices.

A’” = ( , ), B’” = ( , ), C’” = ( , ), D’” = ( , )

1. Are the shapes congruent? Explain.
2. Are they similar? Explain.

**Activity 2: Create Your Own Translation**

1. Set up an x-axis and y-axis on your graph paper

1. Draw a design on your graph paper. (minimum 5 points up to 10 points) eg House shape
2. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.
3. Translate your points to the right 5 units and down 3 units, locate and label (show your work).
4. Translate your original points to the left 8 units and up 3 units, locate and label (show your work). Record the new Ordered Pairs.
5. Color your design.

**Activity 3: Reflection Trapezium**

1. Use the graph paper **vertically**. Put the origin in the centre. Locate these points.

A= ( 3, 3 ), B= ( 5, 7 ), C= ( 8, 7) and D= (12, 3 )

Connect ABCDA to make a trapezium.

1. Reflect over the y-axis to get A’, B’, C’, D’

A’= ( , ), B’= ( , ), C’= ( , ) and D’= ( , )

Locate these points and connect them to make a trapezium.

How is this trapezium related to the one you made in part 1?

1. Reflect over the x-axis using the original A, B, C, D

A”= ( , ), B”= ( , ), C”= ( , ) and D”= ( , )

Locate these points and connect them to make a trapezoid.

How is this trapezium related to the one you made in part one?

1. Reflect over the origin by multiplying both the x- coordinate and y-coordinate in part 1 by -1 to get new points:

A’”= ( , ), B’”= ( , ), C’”= ( , ) and D’”= ( , )

Locate these points and connect them to make a trapezium.

How is this trapezium related to the one you made in part 2?

1. Are the shapes congruent? Explain.
2. Are they similar? Explain.

**Activity 4 – Create your own Reflection**

1. Set up an x-axis and y-axis on your graph paper.
2. Draw a design on your graph paper. ( minimum 5 points example. )
3. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.
4. Reflect your points over the y-axis, locate and label (Show your work).
5. Reflect your points over the x-axis locate and label. (Show your work).
6. Reflect your points over the origin locate and label. (Show your work).
7. Colour your design.

**Activity 5: Rotations - Arrow**

1. Use the graph paper vertically. Put the origin in the centre of the paper.
2. Locate these points: A = ( 0, 0 ), B = ( 5 , 10 ), C = ( 5 , 4 ), D = ( 4, 6 ) and E = ( 1, 0 )

Connect ABCDE to make an arrow.

1. Rotate 900 by switching your x-coordinate with your y-coordinate and multiplying your new x-coordinate by a negative one. Notation ( x, y) → ( -y, x )

A’ = ( , ), B’ = ( , ), C’ = ( , ), D’ = ( , ) and E’ = ( , )

1. How is this one related to the original?
2. Rotate 1800 by switching your x-coordinate with your y-coordinate and multiplying your new x-coordinate and y-coordinate by a negative one. **Notation ( x, y) → ( -x, -y )**

A” = ( , ), B” = ( , ), C” = ( , ), D” = ( , ) and E” = ( , )

1. How is this one related to the original?
2. How would you rotate the figure 2700? ( Try to graph it and analyse the two sets of points **Notation** **( x, y) → ( y , -x )**

A’” = ( , ), B’” = ( , ), C’” = ( , ), D’” = ( , ) and E’”= ( , )

1. How is this one related to the original?
2. Are the shapes congruent? Explain.
3. Are they similar? Explain.

Activity 6 –Create your own Rotation

1. Set up an x-axis and y-axis on your graph paper.
2. Draw a design on your graph paper. (minimum 5 points example )
3. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.
4. Rotate your points 900, locate and label (Show your work). (x,y) (-y,x)
5. Rotate your points 1800, locate and label. (Show your work).(x, y) (-x,-y)
6. Rotate your points 2700, locate and label. (Show your work). (x,y) (y, -x)
7. Colour your design.

**Activity 7 –Create your own Design, Using Two of Rotating, Translating and Reflecting**

1. Set up an x-axis and y-axis on your graph paper.
2. **A3 paper will be provided.**
3. Draw a design on your graph paper. (**minimum 10 points** example or it could be a car or mountain range, let your imagination take you away )
4. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.
5. Colour your design